

## 2.12 Binomial Theorem (Key)

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

**Expand the binomial using a calculator to find the binomial coefficients.**

1.  $(a+b)^4$

$$a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$$

2.  $(x+y)^7$

$$x^7 + 7x^6y + 21x^5y^2 + 35x^4y^3 + 35x^3y^4 + 21x^2y^5 + 7xy^6 + y^7$$

**Expand the binomial using Pascal's Triangle to find the coefficients.**

3.  $(x+y)^3$

$$x^3 + 3x^2y + 3xy^2 + y^3$$

4.  $(p+q)^8$

$$p^8 + 8p^7q + 28p^6q^2 + 56p^5q^3 + 70p^4q^4 + 56p^3q^5 + 28p^2q^6 + 8pq^7 + q^8$$

**Evaluate the expression by hand (using the formula) before checking your answer on a grapher. Show work!**

5.  $\binom{9}{2}$

$$36$$

6.  $\binom{166}{166}$

$$1$$

**Find the coefficient of the given term in the binomial expansion.**

7.  $x^{11}y^3$  term,  $(x+y)^{14}$

$$364$$

8.  $x^4$  term,  $(x-2)^{12}$

$$126,720$$

**Use the Binomial Theorem to find a polynomial expansion for the function.**

9.  $f(x) = (x-2)^5$

$$f(x) = x^5 - 10x^4 + 40x^3 - 80x^2 + 80x - 32$$

10.  $h(x) = (2x-1)^7$

$$h(x) = 128x^7 - 448x^6 + 672x^5 - 560x^4 + 280x^3 - 84x^2 + 14x - 1$$

Use the Binomial Theorem to expand each expression.

11.  $(2x + y)^4$

$$16x^4 + 32x^3y + 24x^2y^2 + 8xy^3 + y^4$$

12.  $(\sqrt{x} - \sqrt{y})^6$

$$x^3 - 6x^{\frac{5}{2}}y^{\frac{1}{2}} + 15x^2y - 20x^{\frac{3}{2}}y^{\frac{3}{2}} + 15xy^2 - 6x^{\frac{1}{2}}y^{\frac{5}{2}} + y^3$$

13.  $(x^{-2} + 3)^5$

$$x^{-10} + 15x^{-8} + 90x^{-6} + 270x^{-4} + 405x^{-2} + 243$$

### Practice Review

Factor

14.  $9m^2 + 6mn + n^2$

$$(3m + n)^2$$

15.  $125x^3 + 27y^3$

$$(5x + 3y)(25x^2 - 15xy + 9y^2)$$

Simplify

16.  $\frac{x}{x-1} + \frac{3x-2}{x+2}$

$$\frac{4x^2 - 3x + 2}{(x+2)(x-1)}$$

17.  $\frac{x}{x-3} \cdot \frac{x-5}{x^3 - 6x^2 + 5x}$

$$\frac{1}{(x-3)(x-1)}$$